

Adaptive engineering of coherent soft x-rays

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When a highly intense infrared femtosecond laser pulse interacts with a dielectric medium, it is partially converted into the soft x-ray region, due to a process termed high-harmonic generation. Since the converted soft x-ray light is spatially and temporally coherent, recent interest focuses on the enhancement and control of this highly nonlinear process.

There are two approaches we can consider to optimize the soft x-ray emission: a) control the conversion medium and b) control the generating laser pulse. I will show how we can manipulate molecular gaseous media such that they are more efficient emitters of high-harmonic radiation. In addition, using water-microdroplets as conversion medium will guide our way towards highly efficient coherent soft x-ray generation. When the generating laser pulse shape is manipulated in a rare gas medium, we can not only enhance the conversion efficiency as is already known but we can qualitatively shape the resulting soft x-ray spectra in a very general way. This has a series of important consequences for the future of time-resolved x-ray spectroscopy and control.